

**WHAT IS CLAIMED IS:**

1. A method for determining toner usage for a document of at least one page, comprising the steps of:  
determining the number of pixels that are on in the at least one page;  
comparing the number of pixels that are on compared to a  
predetermined toner usage for a defined number of pixels that are on in a reference  
page; and  
calculating the amount of toner utilized by the at least one page as a  
proportion of that used by the reference page.
2. The method of Claim 1, wherein a pixel in the at least one page can  
be partially on and the step of determining the number of pixels that are on  
comprises determining the percentage on for each of the pixels in the at least one  
page and the step of comparing comprises comparing the number of pixels that are  
on and the percentage on thereof compared to a predetermined toner usage for a  
defined number of pixels that are on to a defined percentage in a reference page.
3. The method of Claim 2, wherein the defined number of pixels are all  
pixels for the reference page and which are on to a defined percentage.
4. The method of Claim 3, wherein the defined percentage is one hundred  
percent.
5. The method of Claim 1, wherein the defined number of pixels are all  
pixels for the reference page.

6. The method of Claim 1 and further comprising the step of printing the document with a marking engine, the step of printing following the step of calculating.
7. The method of Claim 1, wherein the step of determining the number of pixels comprises:
- rasterizing the document of at least one page into a rasterized image; and
- determining the number of pixels that are on in the rasterized image of the at least one page.
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8. The method of Claim 7 and further comprising the step of storing the rasterized image of the at least one page after rasterizing thereof and prior to the step of determining.
9. The method of Claim 1 and further comprising determining the toner usage for the defined number of pixels on the reference page by the steps of:
- generating a page having the defined number of pixels contained thereon as a test page;
- initiating printing of the test page with a toner cartridge of a known toner level;
- terminating printing of the test page after the toner level in the toner cartridge has reached a known lower limit such that total toner utilized is known; and
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- determining an average value of total toner utilized on a given one of the printed test pages as a function of the pixels that are on for the total toner utilized for the printed test pages.

10. A method for determining the approximate toner level in a toner cartridge in a print engine, comprising the steps of:  
rasterizing an input data file input job into individual pages;  
determining the amount of toner that is to be disposed on each page  
prior to printing the page by determining the percentage of pixels in a given rasterized image;  
printing the image; and  
decrementing a toner count value by a defined amount associated with the determined toner for the given page.

11. The method of Claim 10, wherein a multi-page document is received and all of the pages are rasterized and further comprising the step of determining the amount of toner for the entire document prior to printing and then determining if sufficient toner is available in the toner module by comparing the toner density register value with a predetermined value and inhibiting printing if the toner density register value is less than the determined amount of toner for the rasterized multi-page document.

12. A method for determining toner usage for a multi-color document of at least one page, having different color planes, comprising the steps for each plane of:

determining the number of pixels that are on in the at least one page in the given plane;

5 comparing the number of pixels that are on compared to a predetermined toner usage of toner associated with the given plane for a defined number of pixels that are on in a reference page of the given plane; and

10 calculating the amount of toner for the given plane, utilized by the at least one page of the given plane as a proportion of that used by the reference page for the given plane.

13. The method of Claim 12, wherein a pixel in the at least one page for a given plane can be partially on and the step of determining the number of pixels that are on for the given plane comprises determining the percentage on for each of the pixels in the at least one page and the step of comparing for each plane comprises comparing the number of pixels that are on and the percentage on thereof compared to a predetermined toner usage for a defined number of pixels that are on to a defined percentage in a reference page for the given plane.

14. The method of Claim 13, wherein the defined number of pixels are all pixels for the reference page for the given plane and which are on to a defined percentage.

15. The method of Claim 14, wherein the defined percentage is one hundred percent.

16. The method of Claim 12, wherein the defined number of pixels are all pixels for the reference page for the given plane.

17. The method of Claim 12 and further comprising the step of printing the document with a marking engine, the step of printing following the step of calculating for each plane.

18. The method of Claim 12, wherein the step of determining the number of pixels for a given plane comprises:

rasterizing the document of at least one page into a rasterized image for each plane; and

5 determining the number of pixels that are on in each plane in the rasterized image of the at least one page.

19. The method of Claim 18 and further comprising the step of storing the rasterized image for each plane of the at least one page after rasterizing thereof and prior to the step of determining.

20. The method of Claim 12 and further comprising determining the toner usage for the defined number of pixels on the reference page of the given plane by the steps of:

5 generating a page having the defined number of pixels contained thereon as a test page for each color plane;

initiating printing of the test page with a toner cartridge for each plane of a known toner level for that plane;

10 terminating printing of the test page after the toner level in the toner cartridge has reached a known lower limit such that total toner utilized is known for that plane; and

determining an average value of total toner utilized on a given one of the printed test pages as a function of the pixels that are on for the total toner utilized for the printed test pages for each plane.

21. A method for determining toner usage for a multi-page document, comprising the steps of:

determining the number of pixels that are on in document;

comparing the number of pixels that are on compared to a

5 predetermined toner usage for a defined number of pixels that are on in a reference page; and

calculating the amount of toner utilized by the entire document as a proportion of that used by the reference page.

22. The method of Claim 21, wherein a pixel in the document can be partially on and the step of determining the number of pixels that are on comprises determining the percentage on for each of the pixels in the document and the step of comparing comprises comparing the number of pixels that are on and the percentage on thereof compared to a predetermined toner usage for a defined number of pixels that are on to a defined percentage in a reference page.

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23. The method of Claim 22, wherein the defined number of pixels are all pixels for the reference page and which are on to a defined percentage.

24. The method of Claim 23, wherein the defined percentage is one hundred percent.

25. The method of Claim 21, wherein the defined number of pixels are all pixels for the reference page.

26. The method of Claim 21 and further comprising the step of printing the document with a marking engine, the step of printing following the step of calculating.

27. The method of Claim 21, wherein the step of determining the number of pixels comprises:

rasterizing the document into a plurality of rasterized images, each comprised of a rasterized page of the document; and

5 determining the number of pixels that are on in each of the rasterized images.

28. The method of Claim 27 and further comprising the step of storing the rasterized images after rasterizing thereof and prior to the step of determining.

29. The method of Claim 27, and further comprising the steps of:

determining the available toner for printing;  
comparing the required toner for the multi-page document with the available toner;

5 determining the amount of toner required for the rasterized image of each page; and

printing only the number pages that will equal the available toner.

30. The method of Claim 29, wherein the step of determining the available toner comprises the steps of:

initiating a counter at a first known toner level for a print engine;  
decrementing the counter by the determined toner requirement of a  
5 document or a portion thereof after printing of the document; and  
subtracting from the counter value a known minimum toner value  
that defines a toner empty condition, this value defined as the available toner level.

31. The method of Claim 21 and further comprising determining the toner usage for the defined number of pixels on the reference page by the steps of:

generating a page having the defined number of pixels contained thereon as a test page;

- 5 initiating printing of the test page with a toner cartridge of a known toner level;
- terminating printing of the test page after the toner level in the toner cartridge has reached a known lower limit such that total toner utilized is known; and
- 10 determining an average value of total toner utilized on a given one of the printed test pages as a function of the pixels that are on for the total toner utilized for the printed test pages.

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